Benthic Invertebrate Monitoring in Muskoka: Insights & Opportunities

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Dorset Environmental Science Centre

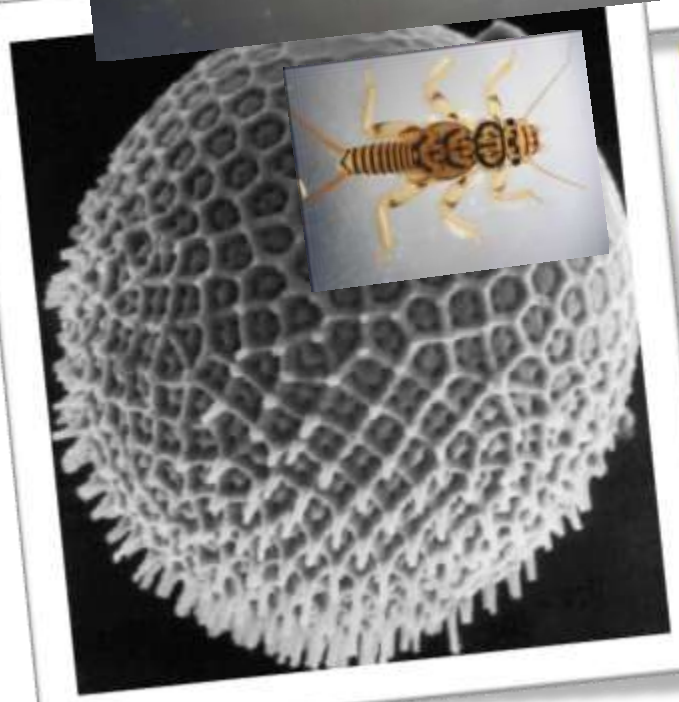
- The Dorset Environmental Science Centre (DESC) serves as MOE's centre of scientific expertise on environmental issues affecting Ontario's inland lakes.
- DESC was established ~1975 to develop the Lakeshore Capacity Model, but then acid rain took over as a focal point for research.
- in 1988, biomonitoring efforts were expanded to include benthos and crayfish & assessing biological recovery.
- Today, many different initiatives…

Major Scientific Focus

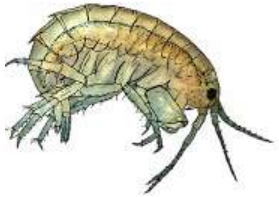
- Long-term monitoring of small, headwater lakes and streams
  - 9 basins in 8 lakes from mid 1970s (>30 years of data)
  - in 1988, bio-monitoring expanded to include benthos and crayfish in 20 lakes and 15 streams
  - sensitive, early-warning ecosystems that can assay changes in water quantity/quality and lake health in response to multiple stressors

Benthic Macroinvertebrates

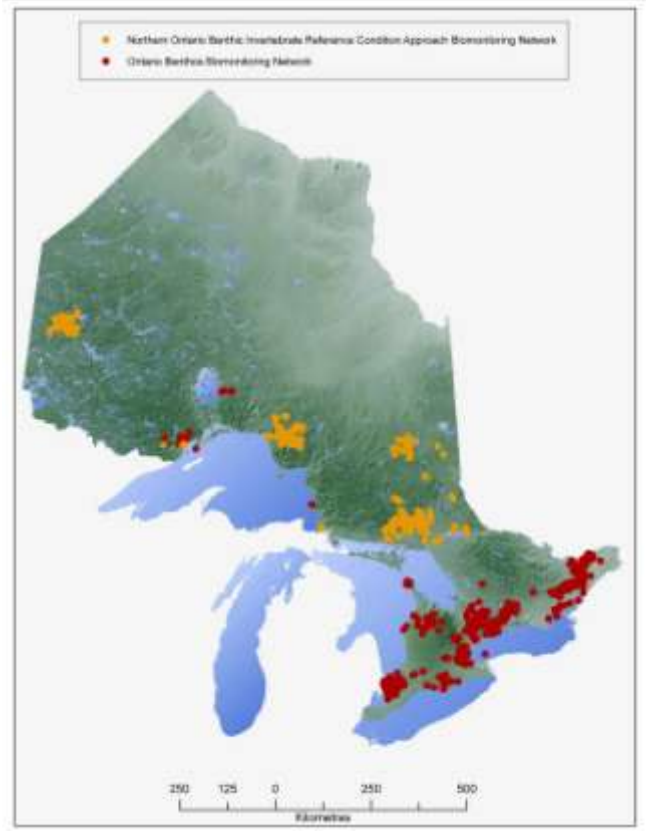
more benthic invertebrates



Ontario Benthos Biomonitoring Network



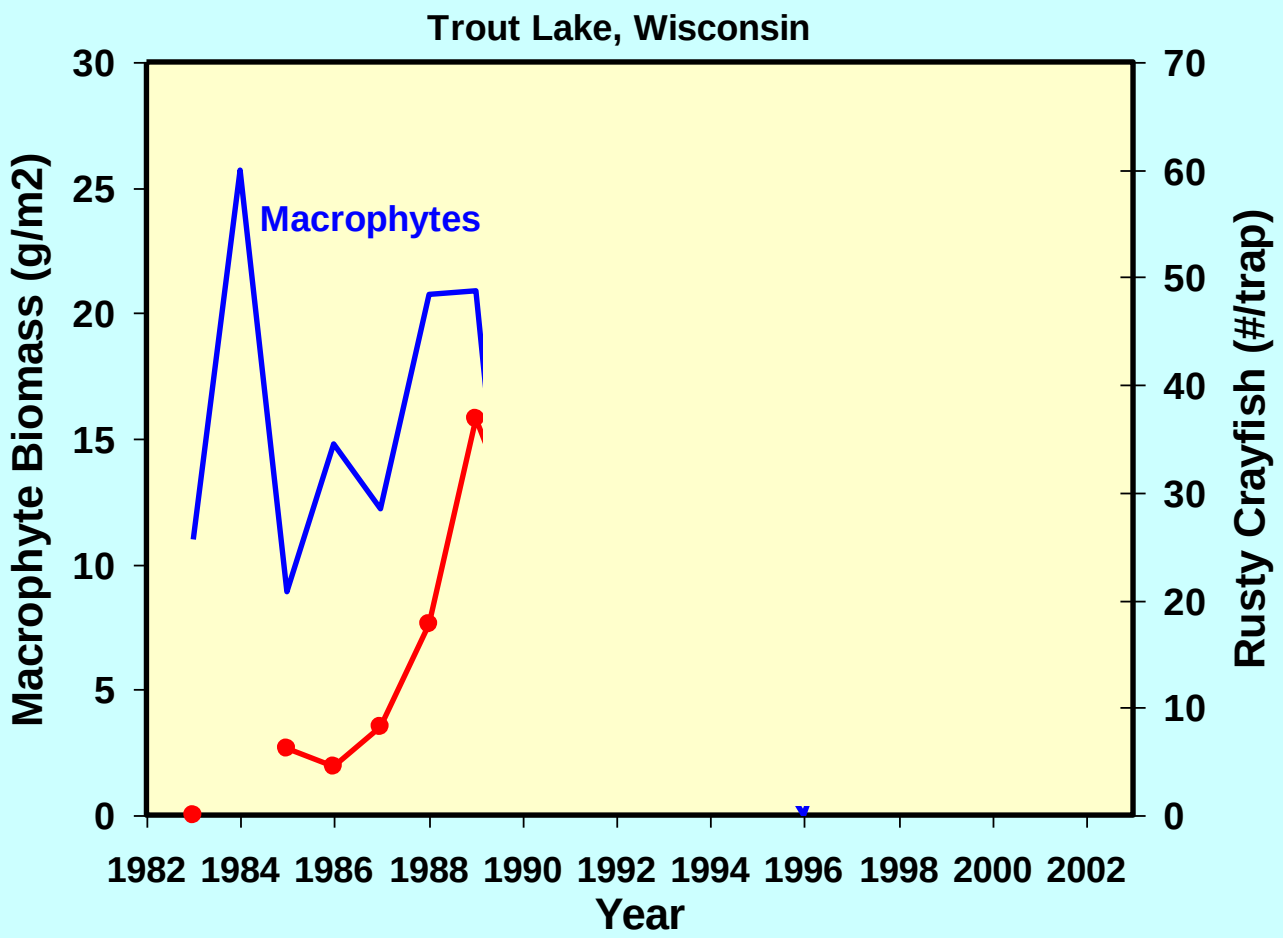
- Began in 2003 , >1000 sites sampled
- Partners: Conservation Authorities, mining industries, universities, national/provincial parks and YOU
- Measures aquatic ecosystem conditions in lakes, streams, and wetlands using bottom-dwelling aquatic invertebrates as indicators.
  - but mostly streams



Why monitor?

- detecting the effects of disturbances
  - by assessing trends and providing ecological baselines and restoration endpoints
- predicting future threats to diversity and ecosystem function
  - via modelling and early detection of stress
- improving our understanding of ecosystem change and testing ecological theory

detecting, predicting and understanding



Why monitor ?

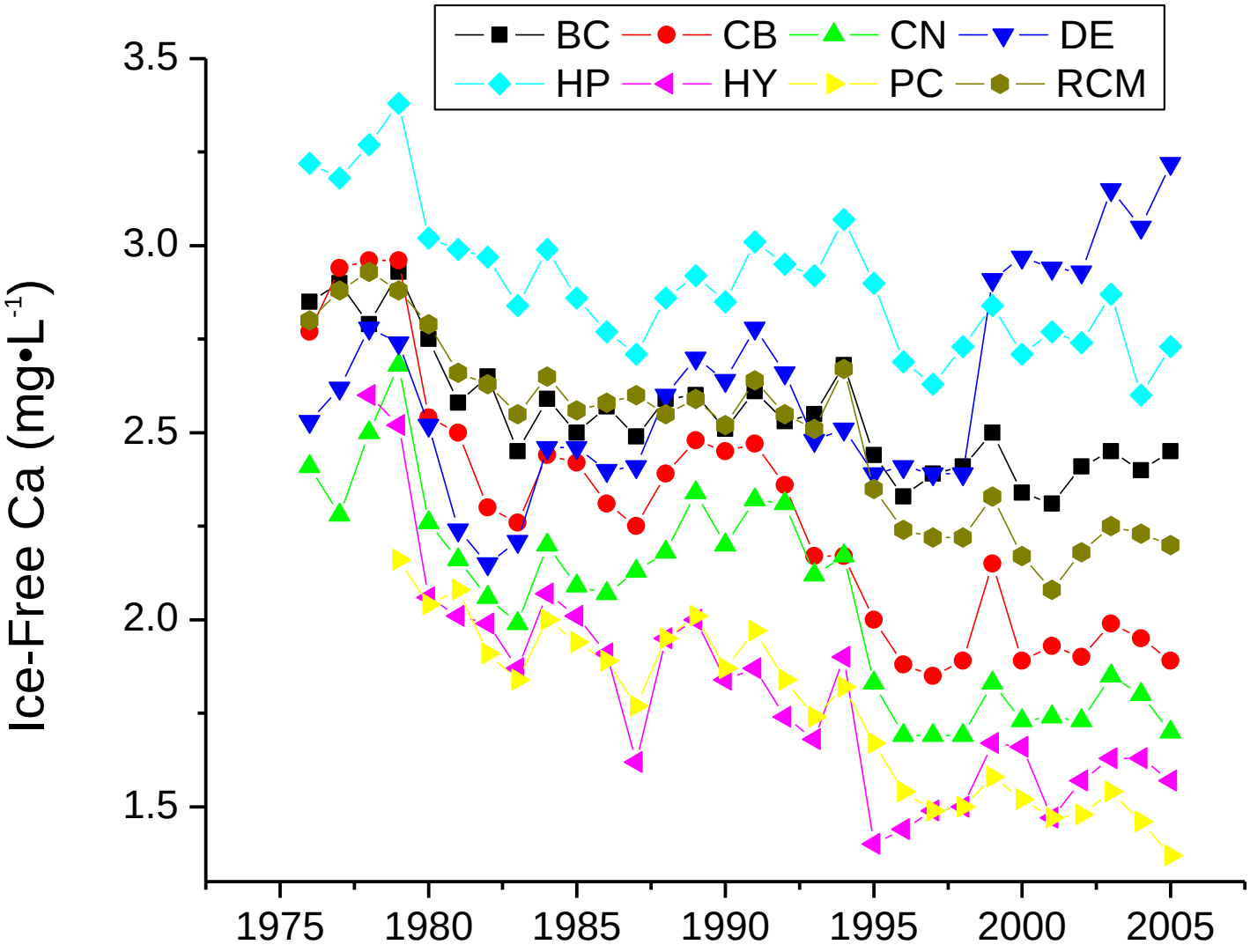
(bugs without backbones in the nearshore areas of lakes)

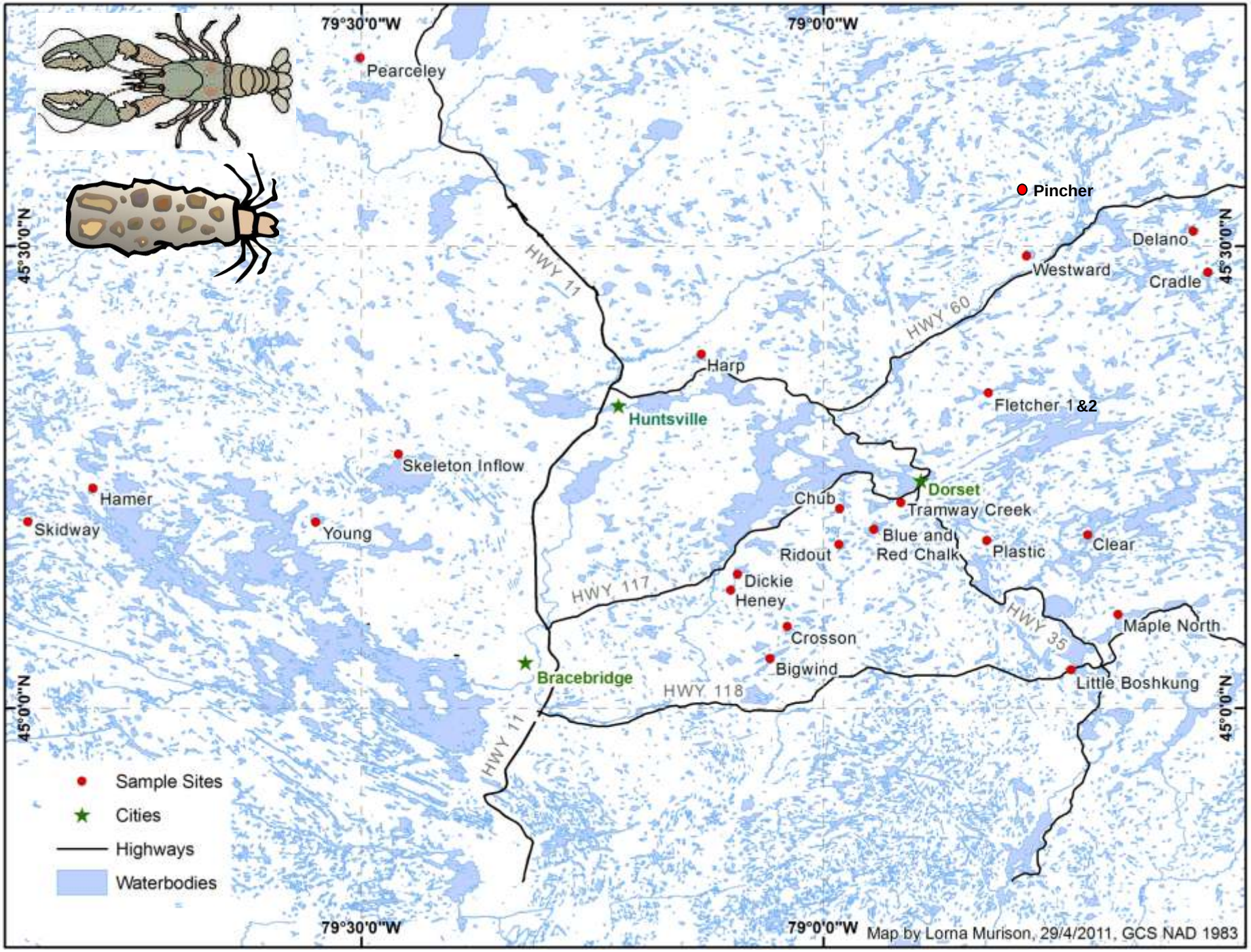
- macroinvertebrates are important indicators of lake and stream health (sensitive to pollution)
- they are a very important source of food for juvenile and adult fish living and feeding in the near-shore (littoral) zone of all lakes
  - the littoral zone is a very productive area of a lake (10 to 40% of whole-lake productivity in a 60 ha lake)
- the biology of a lake integrates the changes occurring in the watershed, thus providing a more holistic indicator of multiple stressors

Multiple stressors

- Development - phosphorus
- Calcium decline
- Invasive species
- Acid precipitation
- Climate change
- Fluctuating water levels
- Plus their interactive effects

Lake calcium concentrations in Muskoka




79°30'0"W
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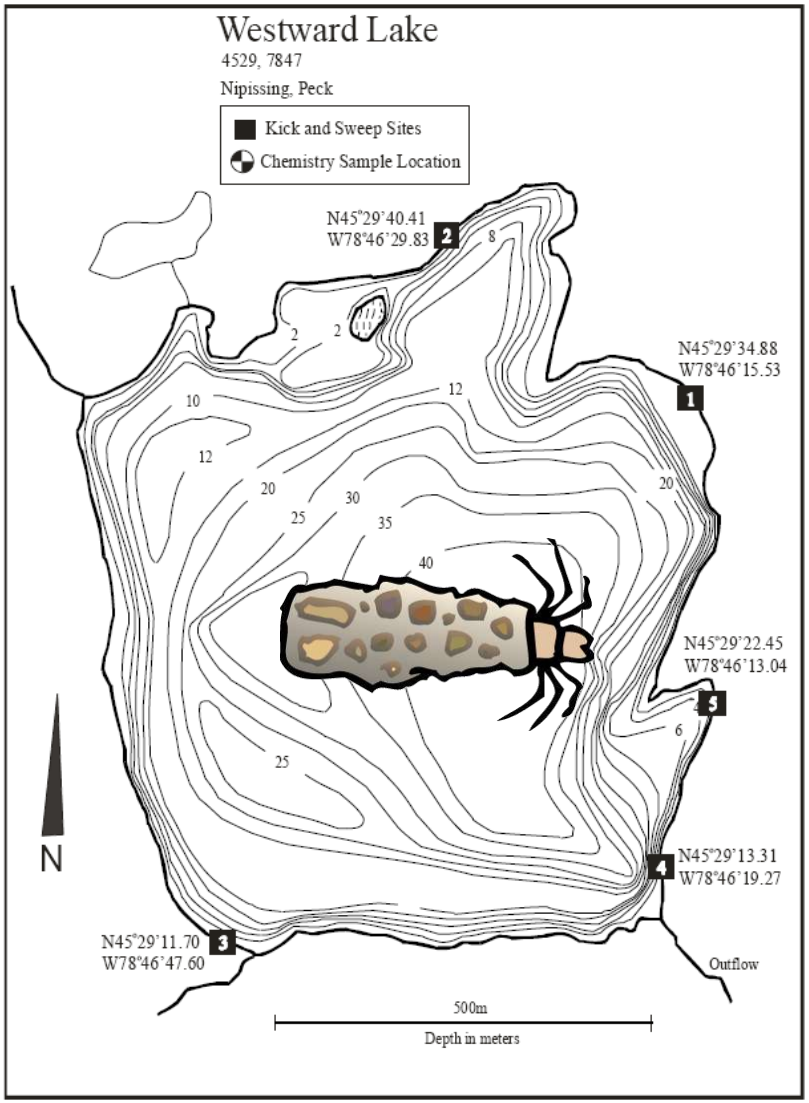
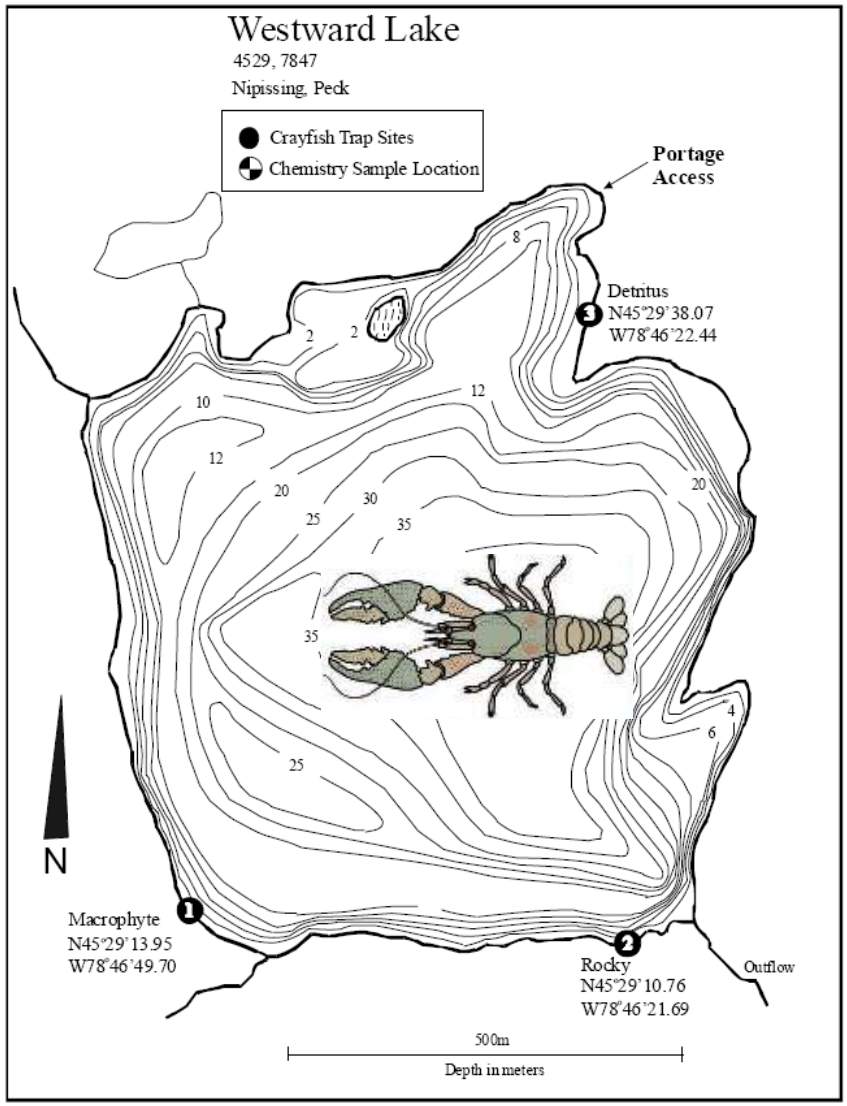
Pearceley
Pincher
Delano
Westward
Cradle
HWY 11
HWY 60
Harp
Huntsville
Fletcher 1&2
Skeleton Inflow
Hamer
Skidway
Young
Dorset
Chub
Tramway Creek
Blue and
Red Chalk
Plastic
Clear
Ridout
Dickie
Heney
HWY 117
HWY 35
Maple North
Crosson
Bigwind
Bracebridge
HWY 118
Little Boshkung
Sample Sites
Cities
Highways
Waterbodies
Map by Lorna Murison, 29/4/2011, GCS NAD 1983

benthos and crayfish sampling





Benthos Sampling Method

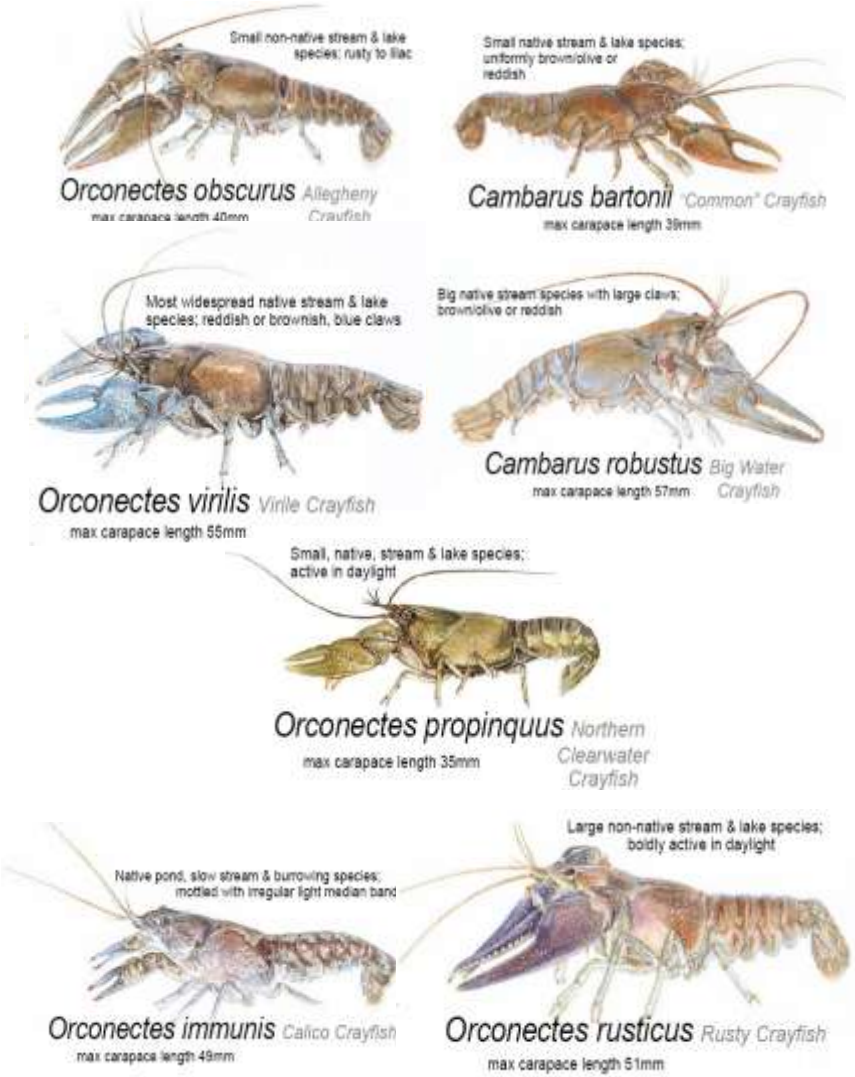
Benthic Sample Processing

- Sieve
- Sub-sample
- Sort, ID and tally carefully
  - taxonomic level matches training; Family or more detailed identification
- 100-count
  - minimum for each of five lake sampling sites
- Preserve and archive sample

Crayfish Sampling Method

Crayfish Sample Processing

- identify
- count, measure, sex, maturity, hardness and condition
- calculate catch-per-unit-effort (CUE)
  - total number captured / 54 traps



Objective 1: Insights

1. detecting emerging patterns and the effects of multiple stressors
   - by assessing trends and providing ecological baselines and restoration endpoints
2. predicting future threats to diversity and ecosystem function
   - via modelling and early detection of impacts
3. improving our understanding of ecosystem change and testing ecological theory

Insight1: Detecting trends

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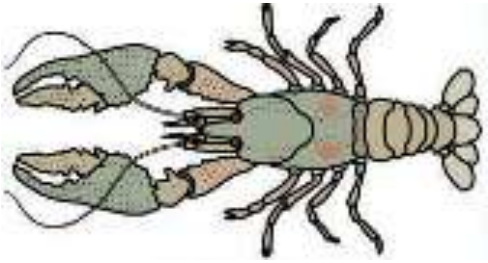
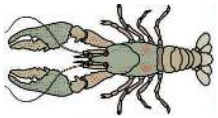
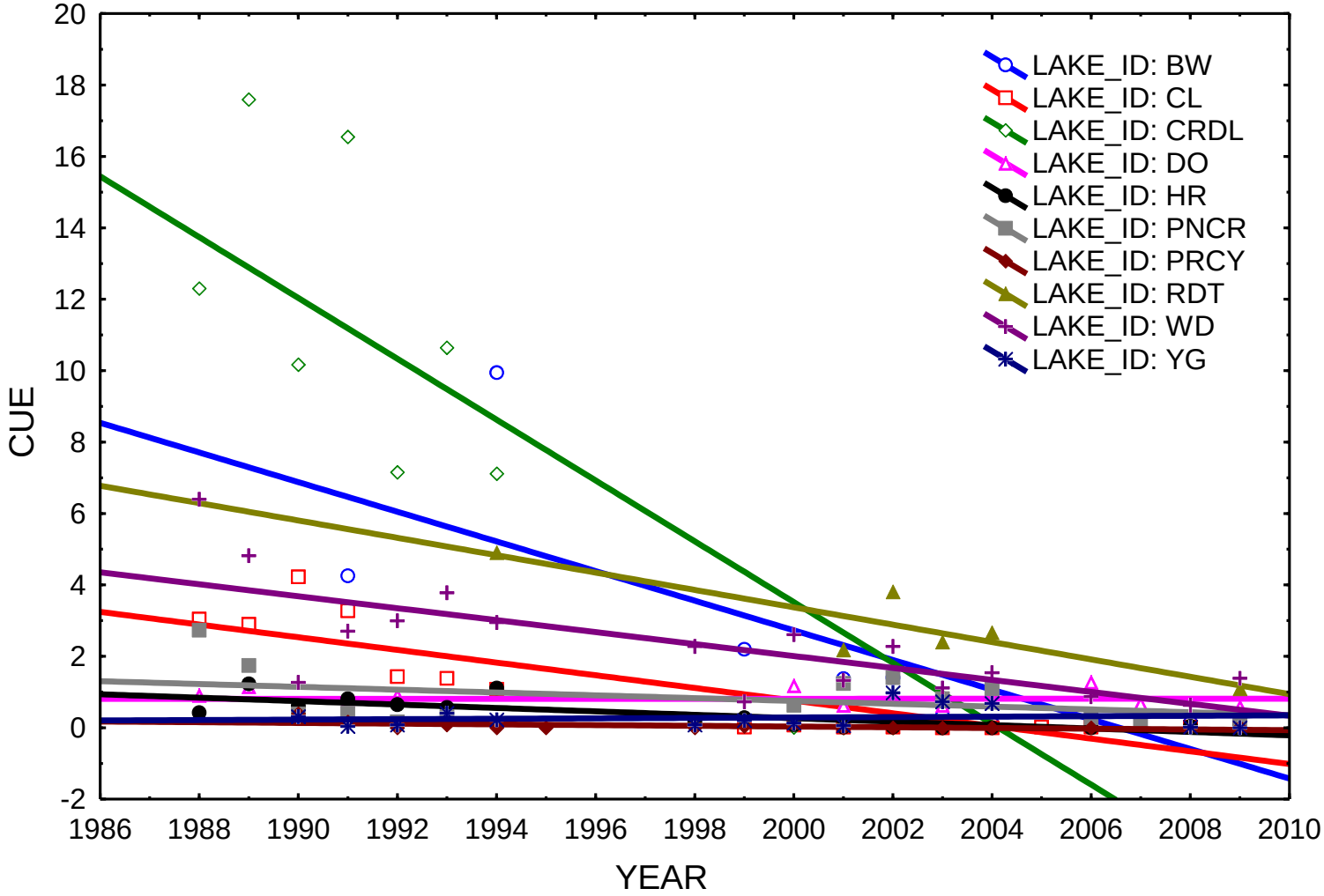


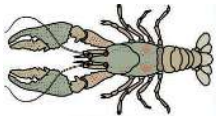
+ time

= detection



crayfish declines in Muskoka





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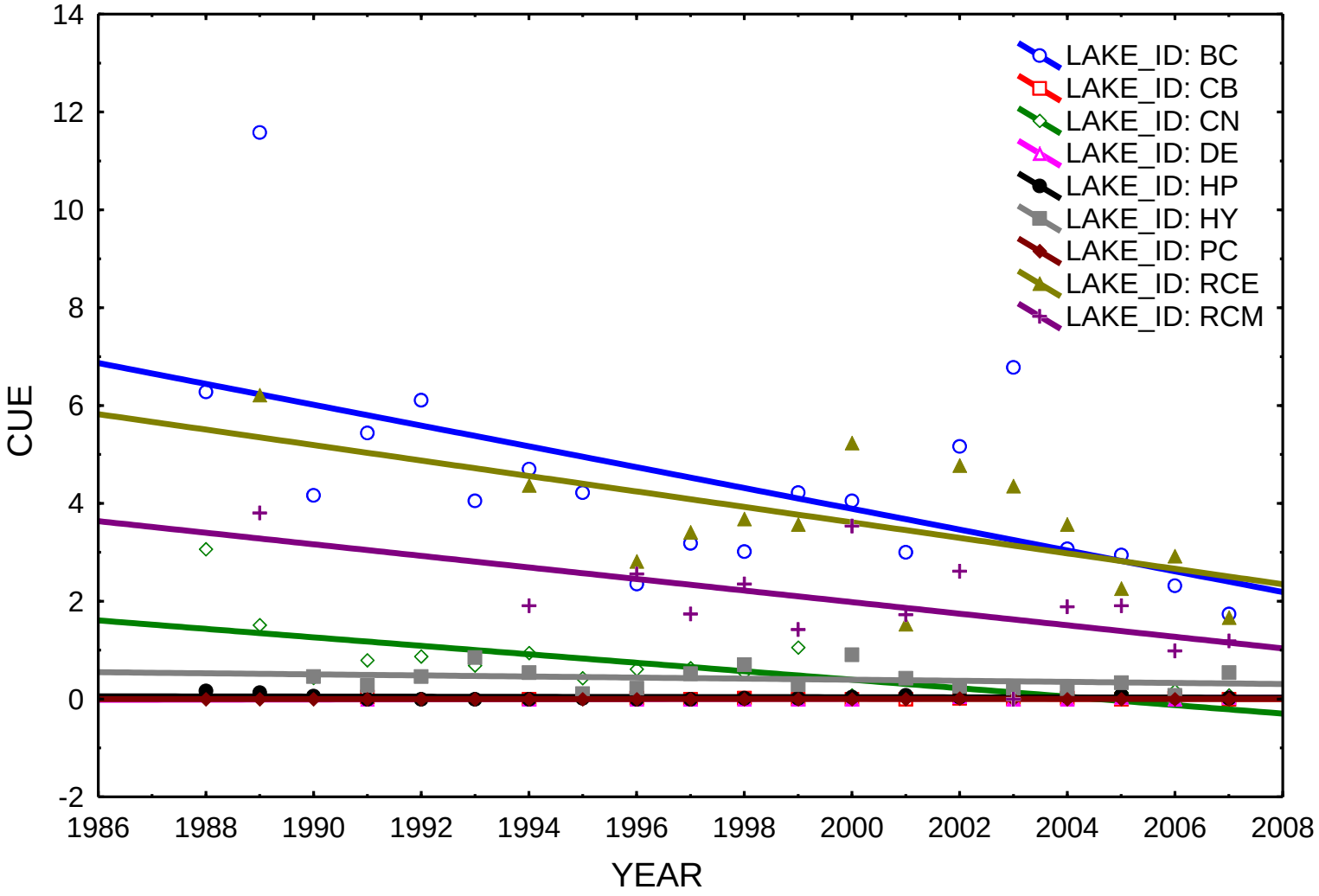

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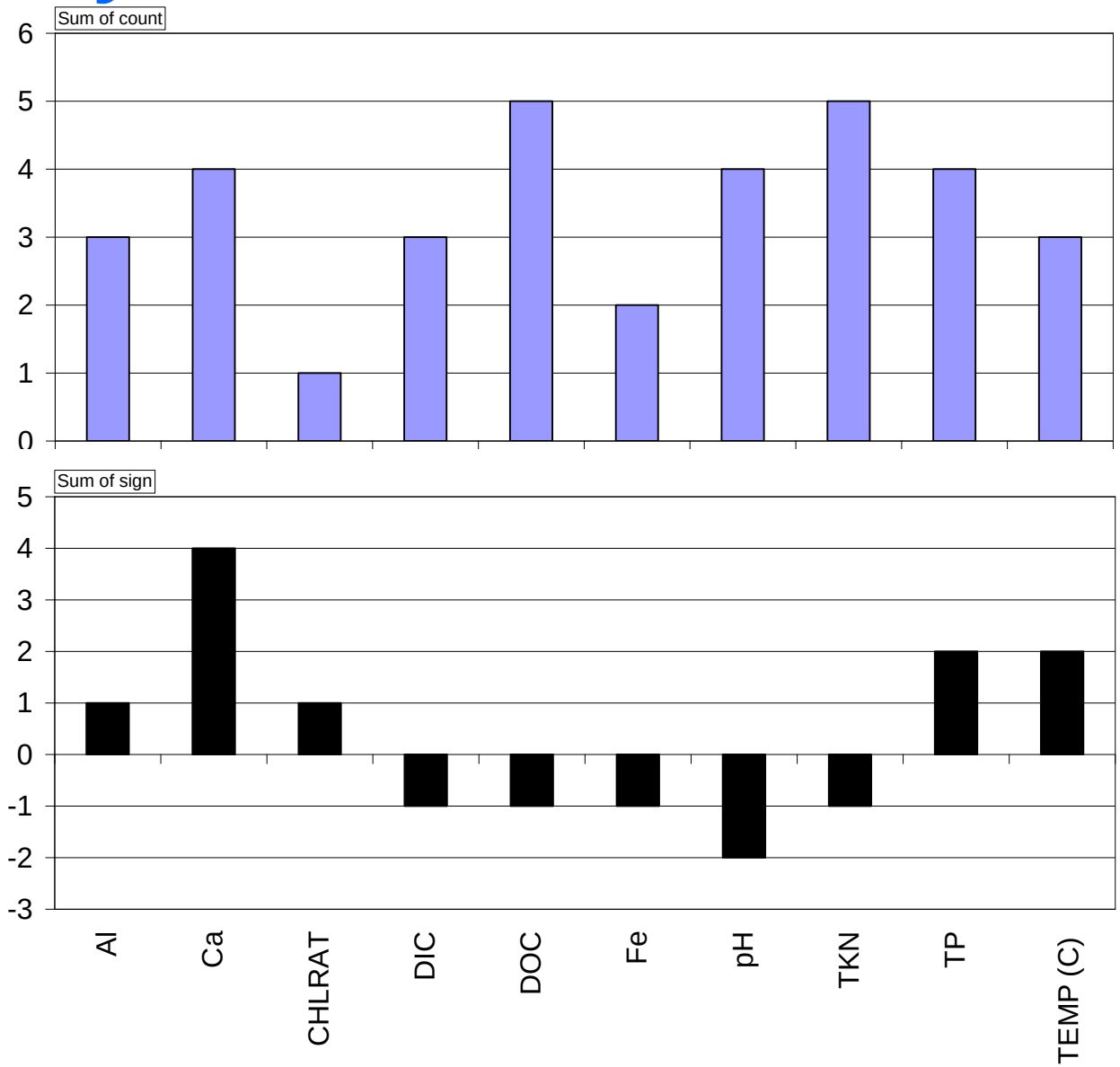
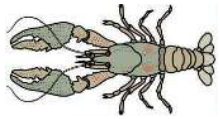
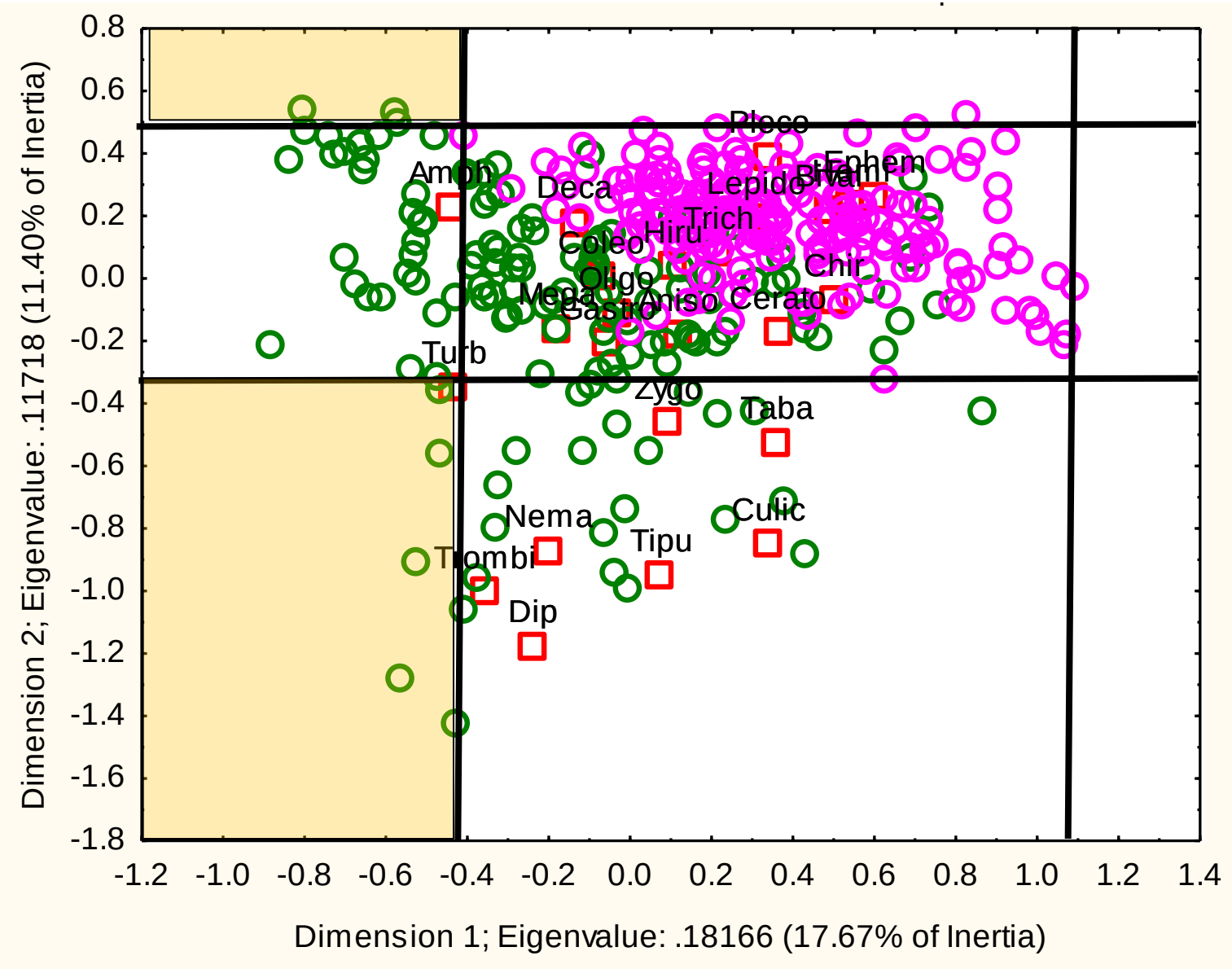




Insight 2: Predicting future threats

= prediction

benthic community change in Muskoka



Opportunities!
(for Muskoka)

- Recent Canadian Water Network Funding for the District opens up many opportunities to incorporate existing monitoring into an innovative regional framework
  - Improve detection by expanding spatial coverage
  - Increase prediction via development of new bio-criteria
  - Augment understanding with additional partnerships and datasets

Opportunities!
(for you)

- Join the OBBN!
  - expand the existing focus on streams to increase our coverage of lakes in the region
  - add to a excellent long-term dataset of benthic invertebrates
  - make it a family tradition to sample your favourite lake
  - training available
- Contact: obbnassistant@gmail.com

Dorset Environmental Science Centre

http://desc.ca

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Who We Are

The **Dorset Environmental Science Centre** is an environmental science facility consisting of government, university and non-governmental partners. Through monitoring and research, we collaborate on a broad spectrum of topics related to Ontario's inland aquatic ecosystems and the watersheds in which they reside.

Mission Statement

To investigate the effects of multiple stressors, including climate change, on water quality and quantity in Ontario's inland aquatic ecosystems and sustain the functions and services that these systems provide.

Long-term Ecosystem Science

Focusing on headwater lakes and streams near Dorset, Ontario, this program gathers chemical, physical and biological data to investigate long-term patterns and processes in aquatic ecosystems. A multiple stressor, watershed-scale approach...

Lake Partner Program

The Lake Partner Program is Ontario's volunteer-based, water-quality monitoring program that provides nutrient (total phosphorus) and water clarity information for Ontario's inland lakes. More than 600 lakes are monitored annually by volunteers.

Ontario Benthos Biomonitoring Network

The OBBN is a provincial network that uses a variety of partners and volunteers to collect bottom-dwelling aquatic invertebrates as indicators of ecosystem health in lakes, streams and wetlands. The network features standard sampling protocols, training, and...

Water Chemistry Laboratory

The DESC chemistry laboratory is a state-of-the-art analytical facility dedicated to characterizing a wide array of variables in lakes and streams of Ontario.

News:

Major Funding Announced to Study the Muskoka Watershed
2011-07-04
A new funding program from the...

Dorset co-authored paper recognized by Global Change Biology
2011-06-10
as one of the top 25 most-cited articles since 2008. This **paper** ...

May 2011 Ecology Issue features Dorset science collaboration
2011-05-19
The latest issue of **Ecology** contains a Dorset co-authored...

more...

Events:

The Dorset Science Report
2011-07-21 19:00 - 20:00
DESC science initiatives will be highlighted on the evening of July 21st, 2011...

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thanks!

- Chris Jones
- Sarah Sinclair
- countless undergraduate students for sampling assisstance

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